as an independent department, he was responsible for the expenditure of more than two million dollars. He was also entrusted with the representation of Maryland on the re-survey of the boundary between that State and Pennsylvania. He was executive officer of the Maryland Forestry Board, and took an active share in the replanning of Baltimore after the great fire in 1904. Meanwhile he had been continuously active in the development of the mineral resources of Maryland and in various spheres of educational and philanthropic work.

His death will be deplored in this country by many friends who knew the charm of his personality and by the still wider circle who knew of his success in scientific administration.

NOTES.

Two new orders have been instituted by the King in recognition of services rendered by British subjects and their Allies in connection with the war, viz. the Order of the British Empire and the Order of the Companions of Honour. The Order of the British Empire has five classes, viz.:—*Men*: (1) Knights Grand Cross (G.B.E.); (2) Knights Commanders (K.B.E.); (3) Commanders (C.B.E.); (4) Officers (O.B.E.); (5) Members (M.B.E.). *Women*: (1) Dames Grand Cross (G.B.E.); (2) Dames Commanders (D.B.E.); (3) Commanders (C.B.E.); (4) Officers (O.B.E.); (5) Members (M.B.E.). The first two classes, in the case of men, carry the honour of knighthood, and in the case of women the privilege of prefixing the title "Dame" to their names. The first lists of appointments to the orders have just been issued, and among those named we notice the following:—To the Order of the British Empire: Lord Moulton and Lord Sydenham (G.B.E.); Mr. Dugald Clerk, Prof. H. S. Jackson, and Mr. R. Threlfall (K.B.E.); Dr. Garrett Anderson, Prof. H. B. Baker, Mr. L. Bairstow, Prof. W. H. Bragg, Prof. S. J. Chapman, Mr. W. Duddell, Mr. F. W. Harbord, Prof. F. W. Keeble, Dr. Mary A. D. Scharlieb, and Prof. J. F. Thorpe (C.B.E.); Prof. J. C. McLennan (O.B.E.). The following have, among others, been appointed Companions of Honour: The Hon. E. Strutt and Prof. Ripper.

A COMMITTEE to inquire into various matters connected with the *personnel* and administration of the Army medical services has been appointed by the Secretary of State for War. The committee is composed of Major-General Sir F. Howard (chairman), Sir Rickman J. Godlee, Bart., Sir Frederick Taylor, Bart., Sir W. Watson-Cheyne, Bart., Dr. Norman Walker, Lieut.-Col. A. J. Stiles, Dr. Buttar, and Dr. J. B. Christopherson (secretary). It will begin its work in France, and afterwards carry out similar investigations in this country.

WE regret to see the announcement of the death, at the age of seventy years, of Major A. N. Leeds, the palæontologist, which occurred on Saturday last.

THE death is announced, at the age of seventy-three years, of Mr. Donald Maclennan, well known as a breeder of pedigree stock.

WE regret to record the death of Mr. Walter E. Archer, which occurred suddenly on August 19 at Sand, Norway, at the age of sixty-two. Mr. Archer was successively Inspector of Salmon Fisheries for Scotland (1892–98), Chief Inspector of Fisheries under the Board of Trade (1898–1903), and Assistant Secretary in charge of the Fisheries Department of the Board of Agriculture and Fisheries (1903–12). When in Scotland Mr. Archer, in association with Prof. Noel Paton, Mr. J. R. Tosh, and others, instituted a series of investigations on the salmon, which helped to elucidate a number of points which were still obscure in the life-history of that fish. In London Mr. Archer devoted great attention to the development of a more efficient system for the collection and subsequent study of the statistics of English sea fisheries, and the very valuable work in that direction now done by the Board of Agriculture and Fisheries is chiefly due to his initiative. He was for a number of years a British delegate to the International Council for the Investigation of the Sea, and president of that body from 1909 to 1912.

THE science staff at Christ's Hospital has again suffered severely from the war by the death on active service of Lieut.-Col. T. H. Boardman, who died of wounds on August 4. Col. Boardman joined the school when it was removed to Horsham in 1902, and was one of the four masters appointed to establish and develop a science department under the new conditions. His previous experience as science master at Blair Lodge, following a brilliant career at Bury Grammar School and at Peterhouse, Cambridge, was invaluable in the pioneer work of winning for science a footing in a public school of classical traditions. Adopting essentially the heuristic method, he proved himself to be a teacher of the highest order, with a power of control and organisation that contributed in no small degree to the success and popularity of the new department. Although he was co-editor with Mr. Wm. French in a school text-book on chemistry, physics was his special *forte*, and before he left to take up his commission as Major in the Royal Fusiliers on the outbreak of war, he had brought his laboratory to a high state of efficiency. Originality and thoroughness were stamped on everything he undertook, and many were the ingenious devices he invented for illustrating the principles of the various branches of physics dealt with. For many years he carried out with some of his classes an interesting scheme of agricultural experiments, the results of which he utilised as a basis for much useful work in the laboratory. "A hero and a gentleman," one of his officers writes of him, loved and respected by all who knew him, his willing sacrifice for King and country is a loss to the school immeasurable, and to his wide circle of friends a sorrow beyond expression.

THE death is announced, in his forty-sixth year, of Prof. Albert F. Ganz, holder of the chair of electrical engineering since 1902 at the Stevens Institute of Technology, Hoboken, N.J. Prof. Ganz had previously held the post of assistant professor of physics and applied electricity at the same institution. He had specialised in electric lighting and in the investigation of the corrosion of underground structures by electrolysis, on which subjects he had contributed largely to American technical journals.

DONATIONS and promises towards the Ramsay Memorial Fund received by the honorary treasurers amount so far to 21,352*l*., including 835*l*. from members of the British Science Guild; 500*l*. from Sir George Beilby, and 100*l*. each from Lord Rosebery, the Company of Clothworkers, and the Salt Union, Ltd. Prof. Orme Masson, of the University of Melbourne, has undertaken to act as the representative and corresponding member of the committee for Australia. As already announced, Prof. C. Baskerville, of the College of the City of New York, is acting in a similar capacity for the United States.

SEVERAL letters on the sound of gunfiring have appeared in the *Times* (August 22, 24, and 25), following the interesting letter by Mr. G. F. Sleggs, the greater part of which was reprinted in our last issue (p. 513). The recent letters deal with the transmission of the sound-waves by the earth, though the inferences are not always correct, as, for instance, when it is argued that the sound must travel through the ground because it is heard more plainly when the wind is contrary. At Rusthall (near Tunbridge Wells), a gravedigger, who was digging a deep grave, stated that the sound of the firing at the bottom was much louder than on the surface. A lady, lying on the top of Blackdown Hill, in Sussex, heard the heavy bombardment of June 24, but, when sitting up, heard nothing. Another writer recalls an incident of the battle of Waterloo. Marshal Grouchy and several of his staff were at Sart-les-Walhain when an officer reported that firing was heard to the west. "Some of them placed their ears to the ground and thus detected plainly the muffled boom of distant guns."

AN account of a remarkable lightning display was given in the *Morning Post* of August 24, the occurrence happening between sunset and midnight of August 22. The phenomenon was witnessed in London. On the afternoon of August 22 heavy clouds had gathered, and these were dissipated by sundown, when the sky became clear, except that there was a narrow belt of cloud low down on the horizon from north-east through east to south. Near the belt of cloud on the horizon there were at short intervals what are described as vast bursts of flame thrown up into the atmosphere, and at times a flash of ramified, or zigzag, lightning would shoot up far above the cloud. The whole surrounding country seemed illuminated. The source of the flares appeared to be in the vicinity of the east and south-east coasts, and was erroneously attributed by many to war operations. No thunder accompanied the lightning, but thunder cannot be heard for more than ten miles, although lightning is visible ten times that distance and more. Recent weather has been very disturbed, frequent storm areas have traversed England, and thunderstorms have occurred very commonly in many parts of the country, accompanied by strong winds and rain.

REFERENCE was made in our issue of June 21 to the systematic collection of horse-chestnuts for war purposes. A scheme for such collection and utilisation for munition purposes has now been approved, and a circular upon the subject is being sent to local education authorities and secondary schools saying that the Board of Education has been requested by the Minister of Munitions and the Food Controller to bring the scheme to the notice of school authorities, governing bodies, and teachers, and to request their assistance in giving effect to it. It is felt that school children could give most valuable assistance in collecting the chestnuts, and by so doing make a definite contribution to national efficiency. It is suggested, therefore, that the governing bodies, managers, and teachers of schools should organise the efforts of the children for the purpose. To effect this a small committee might be formed in connection with each school or convenient group of schools to undertake the organising work in connection with the scheme in the district concerned, and to answer inquiries. It is understood that in many districts the scheme has already been taken up by private individuals, and it is obviously desirable that all persons undertaking work in connection with the scheme should co-operate with one another. A limited number of sacks and baskets are available for the collection of the nuts, and where there is any difficulty in obtaining bags or baskets locally application should be made to the Director of Propellant Supplies, Ministry of Munitions, 32 Old Queen Street, London, S.W.1. When the collection is complete the committee should inform the Director of Propellant Supplies, as above, stating the estimated quantity of the collection, and the Ministry of Munitions will arrange to remove the nuts and forward them to the factories in the course of the winter.

THE autumn meeting of the Institute of Metals will be held on Wednesday, September 19, in the rooms of the Chemical Society, Burlington House. The following communications are expected:—Experiments on the fatigue of brasses, Dr. B. P. Haigh; Hardness and hardening, Prof. T. Turner; The effects of heat at various temperatures on the rate of softening of cold-rolled aluminium sheet, Prof. H. C. H. Carpenter and L. Taverner; A comparison screen for brass, O. W. Ellis; Further notes on a high-temperature thermostat, J. L. Haughton and D. Hanson; Principles and methods of a new system of gas-firing, A. C. Ionides; Fuel economy in brass-melting furnaces, L. C. Harvey, with additional notes by H. J. Yates; The effect of great hydrostatic pressure on the physical properties of metals, Prof. Z. Jeffries; The use of chromic acid and hydrogen peroxide as an etching agent, S. W. Miller.

THE autumn meeting of the Iron and Steel Institute will be held at the Institution of Civil Engineers, Great George Street, Westminster, on September 20 and 21, when the following papers will be read:—"Present Practice in Briquetting of Iron Ores," G. Barrett and T. B. Rogerson; "Microstructure of Commercially Pure Iron between Ar_3 and Ar_2," W. J. Brooke and F. F. Hunting; 'The Influence of Heat Treatment on the Electrical and Thermal Resistivity and Thermo-electric Potential of some Steels," E. D. Campbell and W. C. Dowd; "New Impact Testing Experiments," G. Charpy and A. Cornu-Thenard; "Heat Treatment of Grey Cast Iron" J. E. Hurst; "Effect of Mass on Heat Treatment," E. F. Law; "Investigation upon a Cast of Acid Open-hearth Steel," T. D. Morgans and F. Rogers; "The Acid Open-hearth Process," F. Rogers; "The Eggertz Test for Combined Carbon in Steel," J. H. Whiteley; "Failure of Boiler Plates in Service and Investigation of Stresses occurring in Riveted Joints," E. B. Wolff.

THE University of Pennsylvania has issued as vol. vii., No. 1, of the series of anthropological publications an account of the excavation of the cemetery of Pachyamnos, Crete, by Mr. R. B. Seager. This place lies on the isthmus of Hierapetra, in the eastern part of the island, and apparently owed its importance to the use of the isthmus as a trade route. The cemetery was accidentally disclosed after a torrential rainstorm in October, 1913. It seems to have continued in use from very early times down to the Late Minoan period. A notable feature in the interments is the utter disregard shown by the Minoans to the graves of their ancestors, the older graves being constantly disturbed by later burials. The corpse usually lies in the jar in a sitting position; there is evidence to show that the body was deposited in the jar with the head downwards, and the jar was then fixed in the ground bottom up, so that it occupied a sitting or crouching position. The jars are usually of small dimensions, and in some cases it would seem that the hip- and collar-bones were broken in order to force the body into the jar; in other cases it is suspected that the bodies were trussed up immediately after death, or even before death had actually taken place. The lack of reverence for the dead is also shown by the fact that the best jars were not given for use in burial, and if a household happened to possess a damaged specimen it was considered good enough to serve as a coffin.

MANY investigations have been made during the last few years on the nature of the microbe of typhus fever. Several bacterial organisms have been isolated in the disease, notably one by Plotz in America a year or two ago, but none has been satisfactorily proved to be the causative organism. It is now announced that Prof. Kenzo Futaki, of Tokio, has discovered the presence of a spirochæta, a protozoon organism, both in the kidney of patients dead of the disease and in monkeys artificially infected with the disease.

THE tenth report on plague investigations in India has been issued by the advisory committee as Plague Supplement v. of the *Journal of Hygiene* (vol. xv.). It contains epidemiological observations on plague in the United Provinces of Agra and Oudh during 1911–12 by Majors Gloster and White, I.M.S. They find that an association of unusual humidity during the winter months in certain districts with severe epidemics of plague is so constant a phenomenon that they feel justified in concluding that one stands to the other as cause to effect. They believe that this relationship is due to the effect of humidity in prolonging the life of rat fleas when separated from their host. Dr. St. John Brooks in another paper finds that plague does not maintain itself in epidemic form when the temperature rises above 80° F. accompanied by a saturation deficiency of more than 0·30 in.

WE have received a letter from Mr. S. Mahdihassan, of Bangalore, commenting on Dr. Hankin's letter on "Ten per cent. Agar-Agar Jelly" which appeared in the issue of NATURE for March 8 last. Mr. Mahdihassan has found exceptional difficulty in sectioning chitinous tissues at the high temperature of the plains of India by the paraffin or any other method, and considers Dr. Hankin's method will prove a boon. He is not clear why large wings of insects should be embedded in agar when celluloid is to be preferred for smaller wings. Presumably small wings *can* be embedded in celluloid, whereas larger wings cannot, hence the value of the agar-agar jelly method for the latter.

IN the *British Medical Journal* for July 28, Sir Patrick Manson gives an admirable summary relating to British contributions to tropical medicine dealing with protozoa, helminths, and beri-beri. In the same number Major McCarrison, I.M.S., details Indian contributions to the advancement of medicine. A somewhat similar summary dealing with the scientific and administrative achievements of the Medical Corps of the United States Army, by Lieut.-Col. McCulloch, appears in the *Scientific Monthly* for May. All these papers give useful surveys of progress in the departments of medicine with which they deal.

IN a paper on "The Probable Error of a Mendelian Class-Frequency" (*American Naturalist*, vol. li., 1917, pp. 144–56), Dr. Raymond Pearl presents a method of calculating and expressing the errors, due to random sampling, of a Mendelian class-frequency. The method consists essentially in expressing each *expected* Mendelian class-frequency as the probable quartile limit for that class-frequency in a supposed second sample of the same size as the observed sample drawn from the same population. These quartile limits are determined from the ordinates of a hypergeometric series. Various simplifications of method are suggested and illustrated, and the method is put forward as a supplement to, not as a substitute for, the "chi-squared" test for the goodness of fit in Mendelian distributions.

THE *American Museum Journal* for May contains an extremely interesting account, by the late Mr. Joseph H. Choate, of the origin and development of the great Natural History Museum of New York, which depended in its early days entirely on the munificence of the more wealthy of its trustees. When it became apparent that it would be quite impossible to build up by private means alone a museum worthy to compete with the museums of Europe, it was decided to appeal to the Legislature for assistance. Immediately a site of eighteen acres in Manhattan Square was granted, and on this the present building was erected. It was opened in 1877. From this date it grew with incredible speed to occupy the position of one of the world's greatest museums. To this number also Col. Theodore Roosevelt contributes some brief but most valuable notes on the loggerhead and green turtles, which, it seems, are commonly attacked and eaten by sharks in the waters of Florida, while Dr. Clyde Fisher contributes a short account of the methods employed in the capture of the "gopher tortoise" in Florida, where it is eaten in large numbers.

DR. COLIN MACKENZIE, in the *Journal of Anatomy* (vol. li., part 3), records the results of his studies on the peritoneum and intestinal tract in Monotremes and Marsupials. His researches have failed to discover in any of the mammalia up to the great Anthropoids the presence of the so-called Jackson's membrane, Lane's band, or Treitz's band, and he therefore concludes that these must be regarded in man as adaptations to the erect posture. He also suggests a revision of the nomenclature now employed in describing the various regions of the human colon. His use of the terms "acquired" and "biological" instead of "adaptive" and "ancestral" is, to say the least, curious.

THE report of the Education Branch of the Board of Agriculture and Fisheries for the year 1915–16 is published in the July issue of the *Journal of the Board of Agriculture*, with a note that owing to conditions due to the war the customary separate issue is suspended. The report affords gratifying evidence that, despite the severe restrictions imposed by the war upon the development of agricultural education and research, much useful work was accomplished during the year under review. It is not surprising to find a great decrease in the numbers of students taking long courses of instruction, whereas the numbers taking short courses were more than maintained. One notes with regret the necessity for the closing of the Royal Agricultural College, Cirencester, and the Agricultural College, Uckfield, Sussex, and the withdrawal of grants from two other institutions as a measure of war economy. Research work suffered severely owing to the heavy drain upon the staffs for Army or munition purposes, but much useful work on problems of immediate technical importance was accomplished, of which the investigations at Cambridge on wheat-breeding and at Rothamsted on soil and manurial problems may be singled out for special mention.

THE volume dealing with the area, crops, live stock, land revenue, assessment, and transfers of land in British India during 1914–15 has been published by the Department of Statistics, India, under the title of "Agricultural Statistics of India," vol. i., price 4*s*. The area treated embraces nearly a million and a quarter square miles, including feudatory States under the control of local governments. Of the total area about 37 per cent. was under crops during the year, and full details of the acreage of each crop is given, both for the provinces and every district. This valuable statistical volume is enhanced by two appendices, the first giving the vernacular names of the crops, and the second being an alphabetical list of crops, with their scientific nomenclature.

A VALUABLE paper on oil shales and torbanites, by Mr. H. R. J. Conacher, appears in the Transactions of the Geological Society of Glasgow (vol. xvi., part ii., pp. 164–92). These bodies form a group of materials characterised by yielding valuable commercial paraffin oils in distillation, and are, at the present moment, of very considerable importance. Torbanehill mineral, or "boghead coal," has been exhausted for some years, and for oil production the shales of Lothian, Fife, and Linlithgow are relied on. The author deals with the megascopic, but more particularly the microscopic, study, together with a rough comparison of the oil yield and its character. Previous work has led to much difference of opinion as to the constitution and origin of the torbanite and oil shales. Micro-constituents are very varied; they include minute carbonised fragments of plants; yellow bodies, regarded variously as remains of algæ, vegetable spores, or as residues from oil globules; shells of minute crustaceans, teeth and scales of fishes; and a high proportion of mineral matter, parts believed to be pyrites crystals. Boghead coal consists of little beyond the yellow bodies, which, the author concludes, on very good reasoning, are metamorphosed resins and these yield the characteristic oil products. Interstices are filled with opaque, amorphous matter, similar to that forming the ground mass of coal, and yield products similar to coal-tars, and from this portion the important nitrogenous constituents in shale products are derived. Unhesitatingly the author ascribes these shales and torbanites to vegetable sources. The boghead coal of Linlithgow represents a deposit formed in a swamp fringed with vegetation, but with open water towards the centre sufficiently deep to prohibit the growth of plants. Drifted vegetable matter reaching the central area became so completely oxidised as to leave practically only the resin. The Lothian oil shales accumulated as the widespread mud-flats of an estuary, the river bringing down a proportion of extremely macerated vegetable matter, the ebb and flow of the tide aiding in the elimination of the woody materials and concentration of the resin.

The Italian Geographical Society continues its series of special publications on the Italian field of operations and the borderlands of Italy. A small volume ("Pagine Geografiche della nostra Guerra") contains six lectures delivered before the society in 1916 on the geography of the war area, the geology of the Trentino, the Adriatic lands of Albania, the Carso, Dalmatia, and the Carnic Alps. The volume is illustrated with several black-and-white maps and one coloured one, which is specially interesting. It is a map of the regions adjoining the present political frontier of Italy in the north-east, and is coloured to show the distribution of races as represented by majorities or minorities of Slavs, Italians, and Germans. The proposed new frontier drawn on this basis shows a close coincidence with the natural physical frontier running along the Alps.

In the *Scientific American* for July 21 Prof. T. H. Norton describes in simple terms the problems in dye synthesis which are now being undertaken by American chemists. He traces the evolution of synthetic dyes from some seven or eight direct coal-tar products ("coal-tar crudes") through the intricate maze of intermediate products to the finished dyewares. The processes whereby the coal-tar crudes are converted into intermediates are the chemical operations of nitration, reduction, sulphonation, alkali fusion, chlorination, oxidation, and sulphur fusions. These processes, constituting the simpler reactions where inorganic reagents are employed, are now carried out on a very large scale and require highly specialised plant, of which illustrations are given. As a concrete example, the care of the important colour-producing intermediate, "H. acid," is cited. This substance, which has the systematic name of 8-amino-α-naphthol-3 : 6-disulphonic acid to distinguish it from 219 isomerides, is derived from naphthalene. The hydrocarbon is treated with sulphuric acid (sulphonation) and converted into naphthalene-2 : 7-disulphonic acid, one of ten possible isomerides. The product is treated with nitric acid (nitration), when 1 : 8-dinitronaphthalene-2 : 7-disulphonic acid is obtained. The dinitro-compound is reduced with acid and iron filings to 1 : 8-diaminonaphthalene-2 : 7-disulphonic acid, the penultimate intermediate which on heating with dilute sulphuric acid under pressure at 120° C. yields the required H. acid. This highly prized intermediate is greatly needed in the preparation of direct cotton blues and various shades of black, violet, and green. The preliminary work to be done in passing from naphthalene to this intermediate may be gauged by the fact that the raw material costs about 5*d*. per lb., whereas H. acid is quoted nowadays at about 10*s*. per lb.

We have received a copy of a pamphlet by Mr. Robert N. Tweedy on "Industrial Alcohol," written for, and published by, the Dublin Co-operative Reference Library. Its object is mainly twofold: first, to emphasise the desirability of producing a home-grown liquid fuel, and secondly to do so to the advantage of agriculture. These two objects are to be fulfilled by the manufacture of potato spirit on a large scale. The author points out that our staple fuel, coal, cannot be used for a variety of industrial purposes, such as the manufacture of chemicals and motor traffic, and that for the latter especially we are dependent on imported petroleum, which is steadily rising in price. In 1914 we imported petrol to the extent of 120 million gallons (imperial), in addition to 150 million gallons of burning oil. The extent to which alcohol is used on the Continent, especially in Germany, for industrial purposes may be judged from the following statistics. Whereas in 1914 a little more than four million gallons of methylated spirit were used in the United Kingdom, in 1912 France produced 87½ million gallons, of which eighteen million gallons were denatured and twelve and a half million gallons were used for heating and lighting. In 1913 Germany produced seventy million gallons from potatoes alone, representing 80 per cent. of the whole production of alcohol, a large proportion of which was used for heating, lighting, and motor traffic. The author lays stress on the fact that denatured alcohol for industrial purposes might be produced with profit from potatoes in the manner that has been developed with so much success in Germany; but that to do this an entire revision of the excise laws will have to be taken in hand. At present it is hedged in with such restrictions that until they are removed or modified there is no prospect of this important branch of agriculture being seriously exploited.

A writer in *La Nature* for August 4 discusses the special features which aeroplanes of the chaser and bombardment types should possess for adequately carrying out the work assigned to them. He takes as examples of the two classes the Gotha type—*i.e.* the type which has been prominent in recent air raids over London—and the Albatros. The Gotha type is characterised by extensive plane area, high engine capacity, and its powerful armament. The latest types carry 600 kilos. of bombs. The power necessary is furnished by two motors of 260–280 h.p. each. The planes cover an area of about 100 sq. metres, while the total length of the aeroplane is 12 metres and the span 24 metres. A speed of 140 kilometres per hour can be attained. The Albatros of the D.I. type has a Mercédès engine of 170 h.p., a plane area of about 24 sq. metres, a length of 7 metres, and a span of 9 metres. It has a speed of 200 kilometres an hour. Further interesting details of the construction of these two types of aeroplane are given in the article quoted.